

“Bicycle” Model for Interdisciplinary approach in Parkinson’s Disease

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Abstract— Parkinson's disease is a multifaceted and symptomatically complex neurodegenerative condition, considered the second most prevalent neuroaging disease, compromising quality of life as the disease progresses. To improve the quality of life, some evidence points to a health model based on interdisciplinarity, however its real benefits are still limited in the literature, compared to the traditional monotherapeutic approach. The objective of this study was to develop a review containing a dynamic, comprehensive methodology, with a modern vision to address the main points of interest that are represented in the research model called "bicycle model". Based on this method involving the interdisciplinary approach on the determinants of health status in Parkinson's disease. The results present strategies to collect data from questions about morbidity, quality of life, health determinants (disease) and disease characteristics. The final considerations presented show that different perspectives result in a broad scope for the interdisciplinary approach, by different professionals within their expertise, with improvement in the quality of life of this research population.

Keywords— Interdisciplinary; Quality of life; Parkinson's disease; Neurodegenerative disorders; Health care.

I. INTRODUCTION

Parkinson's disease is a neuroaging disorder, with neurodegenerative and multisystemic morbidity, which leads to motor and non-motor disorders, among them: cognitive, psychiatric, sleep, metabolic, nutritional and sensory disorders, which play an important role in undermining functionality and quality of life (1-3).

Parkinson's disease does not respond to the simple formula (identification and elimination) "identify the cause and eliminate it" because its development is determined by multiple factors, thus resulting in limited possibilities for rapid interventions. Even when important risk factors are known, it seems difficult to intervene effectively. Due to the limitation of preventive interventions, changes in population distribution (a marked increase in the proportion of the elderly), and social changes, the

prevalence of this disease has increased, and is expected to increase more in the near future (2-4).

Parkinson's disease is the second most common neurodegenerative disease and one of the most prevalent extrapyramidal neurodegenerative syndromes in motor losses. However, there are still no medications that can interrupt the course of the disease or prevent it (6-7).

Given the nature of multifactorial causes, the interdisciplinary approach can contribute to non-pharmacological treatment, without adverse effects, with a focus on maintaining quality of life and functional independence, a condition for performing day-to-day activities, with social interactions in professional and leisure activities (8-10).

The current evidence points to a model of interrelated health behavior, but its real benefits are still

limited in the literature, in face of the traditional therapeutic approach made in isolation (1,11). A better understanding of different models of health performance for Parkinsonians is a way to improve the quality of life, well being and therapeutic resources for this population.

Therefore, the objective of this study was to develop a review containing a dynamic, comprehensive, interdisciplinary and modern approach to addressing the mutual influences of different factors related to Parkinson's disease.

II. METHOD

In this revision model based on interdisciplinary scientific contribution, the main points of interest are captured in the research model (figure 1), called "bicycle model" (12).

The "front wheel" concerns mainly concepts related to the patient, such as quality of life and neuropsychiatric disorders, among them: motor and non-motor. The current lines of research in this wheel focus on the course and consequences of the disease, aiming at an increase in knowledge about the relationships between participation, perceived autonomy and aspects related to the disease.

The "back wheel" focuses on health care, such as factors associated with motor and non-motor signs and symptoms. In this wheel occurs research on continuity and accessibility of care, for example, aiming at the care of patients. Another example of research that occurs in this part of the model concerns the evaluation and its effects on the quality and accessibility of care experienced by the elderly.

The "handlebars", containing determinants of the interdisciplinary approach, is a central concern from the point of view of health education. Research questions focus on motor and non-motor disorders and the associated risk factors.

The "ride" represents the health status in Parkinson's disease. Important issues in this approach concern the longitudinal relationship between health, health behavior and its determinants, with special attention to psychiatric and musculoskeletal complaints in order to be able to analyze the influence of health-related factors.

Another great look in this perspective is the combination with the "front wheel" that makes the axis in determinants of quality of life, under the longitudinal optics.

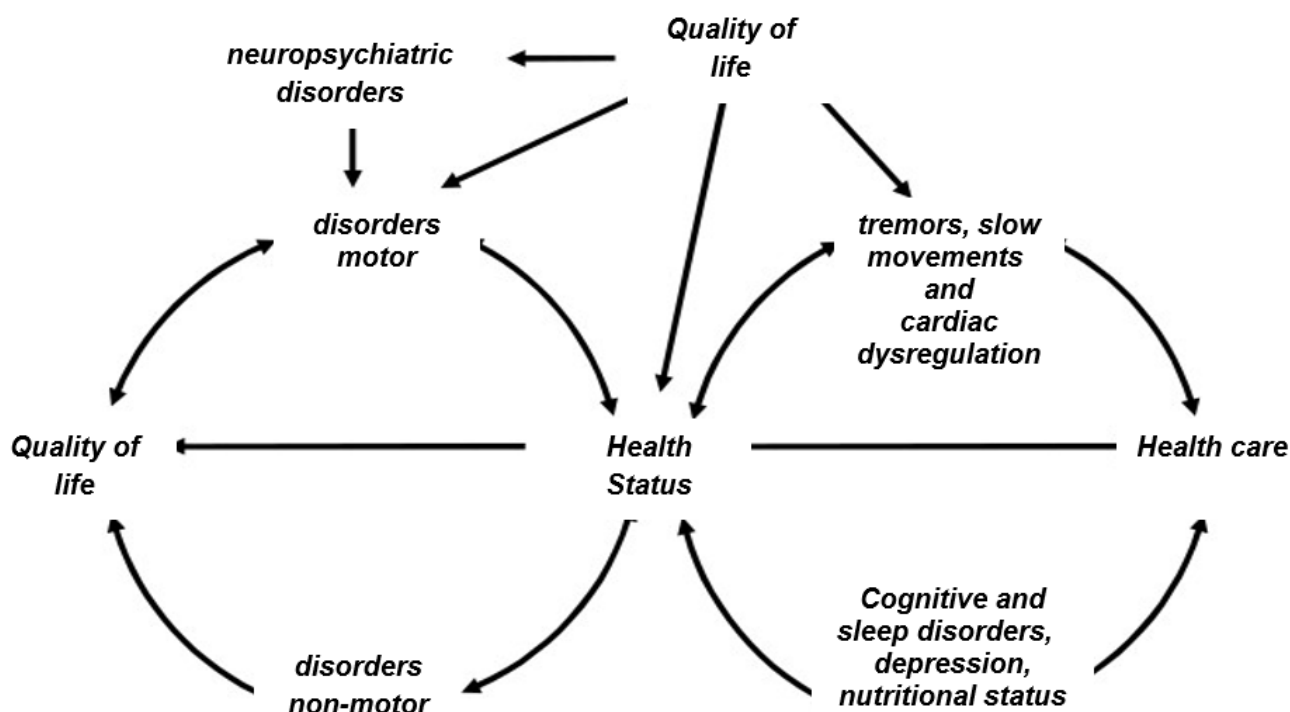


Fig.1: Adapted from the smile study the "Bicycle" Model for addressing the interdisciplinary method in Parkinson's disease.¹²

Based on the "bicycle" method on the determinants of health status in Parkinson's disease, some strategies for search and selection with an interdisciplinary approach were carried out: PICO strategy, concept selection, goal determination (Table 1 and Table 2).

To search the articles we used online access to Medline/ Pubmed, Lilacs, SciELO databases, without filters, due to the scarcity of studies in the research area. The electronic search was carried out from October 10 to 28, 2020 and the descriptors controlled by the Virtual Health Library and Medical Subject Headings (MeSH) Validation were used, with the following keywords and Boolean operators: Parkinson OR Parkinson Disease AND Interdisciplinary OR Multidisciplinary approach AND Life of Quality.

Table 1: PICO Strategy

Itens	Abreviature	Question components
Pacient	P	Parkinson or Parkinson Disease
Intervention	I	Interdisciplinary or Multidisciplinary approach
Control	C	Não se aplica
Outcome	O	Life of Quality

The collection of information and selection of articles took place as follows (Flowchart 1):

- ✓ 1st stage: Identification of the scientific production indexed in the databases by the cited descriptors, which were found to the total n= 28 articles.
- ✓ 2nd step: the articles were organized in a table, containing title, author, journal, volume, year of publication and pre-selected from the reading of the available abstract.
- ✓ 3rd step: the selection of articles was made by reading the abstracts, using as inclusion criteria publications in Portuguese and English with primary data performed in patients with Parkinson's disease in interdisciplinary or multidisciplinary treatment. However, the following were excluded: repeated studies in the different databases (n=7), after reading did not answer the question (n=6), and those that were not found in full (n=5).

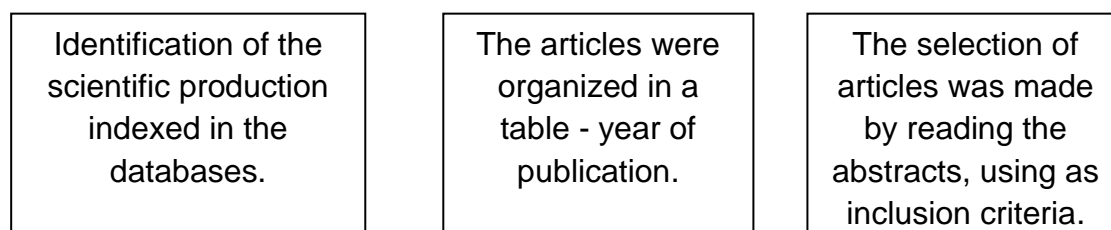
At the end, n= 10 articles from national and international health committees were selected for this review.

Table 2: Interdisciplinary approach study in parkinson's disease

Author/Year	Study Type	Approach	Conclusion	Evidence
(30) Fründt, O. et al; 2018	Intervention study - 16 months	169 individuals aged 39-88 years with Parkinson's disease	Treatment improved motor and non motors, cognition, sleep, pain, cardiovascular control disorders and quality of life. The patients positively evaluated the interdisciplinary approach.	A
(31) Taylor, J. et al; 2016	Literature reviews	Complications in Parkinson's disease and the role of the multidisciplinary team.	The authors emphasize how their multidisciplinary care model facilitates collaboration between psychiatrists and other mental health professionals.	C
(32) García Ramos; 2016	Epidemiological reviews	Review to define public and private	Spain estimated 300,000 patients with Parkinson's disease and a new case	C
		health resources to treatment people with Parkinson's disease and identify specialists.	per 10,000 inhabitants per year and health professionals still need a long way to provide quality, efficient, multidisciplinary and universal health for patients with Parkinson's disease.	
(33) Prizer et al; 2012	Literature reviews	Review the effectiveness of multidisciplinary care in outpatient	The results indicated that multidisciplinary treatment improved the results of patients; however, they signal only short-term results.	C

		environments in individuals with Parkinson's disease .		
(34) Egger s C et al; 2018	Randomized Clinical Trial	300 individuals received an integrated model of end-of-life care.	Patients with Parkinson's disease had a lower mortality rate than the general population, but there are still failures in follow-up, signaling the need to urgently develop models of care for patients with Parkinson's disease.	A
(35) Giladi N, et al; 2014	Literature reviews	Emphasize the importance of the approach in the intervention of the interdisciplinary team in the treatment of Parkinson's Disease.	They discussed approaches and roles in different health professions, including a neurologist, a nurse, a speech therapist, a physiotherapist, a social worker, a psychiatrist, an occupational therapist, a sexologist and a nutritionist.	C
(36) Muñoz BE, et al; 2020	Observational Study	Document the experience of 90 individuals, among patients, caregivers and specialists.	The individuals interviewed 87.9% considered that the multidisciplinary activities improved their quality of life.	B
(37) Guo L, et al; 2009	Randomized study	44 patients submitted to intervention with 45-minute lectures for 8 weeks.	Group education combined in a rehabilitation program has proven to be a beneficial and practical intervention, not only complementing medical treatment for Parkinson's patients, but also meeting the growing demand for long-term care.	B
(38) Trend P. et al, 2002	Observational Study	118 individuals (patients and caregivers) were evaluated for mobility, quality of life.	Participants reported gains in knowledge and high levels of satisfaction with individual therapies and group activities.	B
(39) Tillman n, A.C, et al; 2020.	Non-randomized clinical trial	24 individuals participated for 12 weeks in samba classes and measures of depression, cognition, fatigue, sleep and severity of Parkinson's disease were assessed.	Interventions such as dancing had greater effects on non-motor symptoms, depending on the expected evolution of the disease. The scarcity of studies that use this approach in their analysis may explain the lack of evidence in this dance related symptomatology.	B

Flowchart 1- Stages of data collection



From the analysis, the data obtained were organized into tables, graphs, considering the year of publication, the type of research and the focus of the result of the article.

III. RESULTS

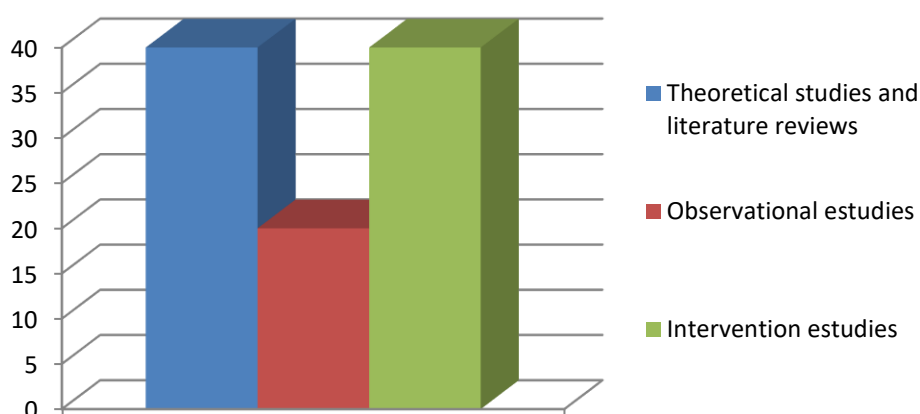
As a result, different perspectives have been explicitly incorporated to ensure the quality of the studies selected in a scope in the interdisciplinary approach.

From the analysis of the 10 articles found that were relevant to the subject, produced over these years (2002 to 2020), which reveals a need to carry out more

studies on this subject, in addition to demonstrating the need to encourage and intensify scientific production to deepen the approach to this subject (Table 1).

As for the type of study, it demonstrated that 40% focus on theoretical studies and literature reviews, 20% observational studies, and 40% intervention studies (Graph 1).

Graph 1- Distribution of different types of studies



The publications found are distributed in 10 journals. Although the studies are well distributed among the journals, it is possible to observe a predominance of production in international journals.

This predominance may be explained by the scientific advancement of researchers in financial resources and by the fact that they have large post-graduate centers and, therefore, knowledge generators.

IV. DISCUSSION

Therefore, this is the first review study that brings an interdisciplinary discussion with the method represented in the "bicycle" model adapted for Parkinson's Disease.

The two wheels of the bicycle are connected through the state of health represented by the "picture" that reinforces the need to broaden the interaction between the interdisciplinary works for functional advances in the quality of life of people with Parkinson's disease (1,3).

In relation to the "front wheel" which refers to the axis of neuropsychiatric determinants, among them: motor and non-motor signs in Parkinson's disease. In general, motor signals are related to tremors, stiffness in body limbs, muscles, and slowness of movement, in addition to extrapyramidal movements. In addition, the

evidence shows dysfunctions in the balance between sympathetic and parasympathetic control of cardiac activity, which compromise cardiovascular regulation, hypotension, especially in orthostatic position (13-17).

Previous studies with Parkinson's patients, using tests of cardiovascular reflexes, demonstrated repressed responses of heart rate to different stimuli, such as normal and deep breathing and Valsalva maneuver. These findings describe autonomic responses, for only a limited period of time, with great individual variability, promoting a limited view of the autonomic mechanisms in the control of cardiac activity (8, 16-19).

Studies that used traditional measures of heart rate variability in the time domain and 24h spectral analysis concluded that the autonomic dysfunction was directly related to the duration and severity of the disease, age and drug use (15, 17- 20).

Regarding non-motor disorders in Parkinson's disease, represented by the "front wheel", the evidence indicates that 98.6% of patients had at least one of the non-motor symptoms, including most commonly psychiatric, sensory and sleep-related symptoms. On average, in this study, each patient presented about eight symptoms, a number that increased according to the time of evolution of the disease and its severity (21-23).

Therefore, understanding the course and stages of the disease, through the signs represented "in the back wheel" can be determinant for an interdisciplinary approach. Since some factors associated with the stages of Parkinson's disease do not yet present a clear relationship, such as forms of dysautonomia, depression and risk of falling (1, 22, 23).

Thus, the "guide" represented by the interdisciplinary approach can be evidenced in the recent randomized study that compared the assistance of the multidisciplinary team with the assistance of the neurologist. The variables investigated were quality of life, depression, psychosocial evaluation and overload of the caregiver. A total of 100 people participated and a significantly higher improvement was observed for the multidisciplinary group in the variables of quality of life, motor score, depression and psychosocial (24).

Another study that compared individuals with Parkinson's disease who practice interdisciplinary activities with those who do not, showed a statistically lower dose of levodopa for individuals with greater severity of the disease, however, they practiced interdisciplinary activities (25).

The interdisciplinary approach is a challenge, but on the other hand it is the one that most favors the adherence of people with parkinson's disease, who seek pleasurable therapies for them, meeting individual demands (26,27).

The individual demands showed resolutiveness with the interdisciplinary actions in the study conducted with 179 individuals who used the Expanded Core of Family Health and Basic Care (NASF-AB). The main reasons that demanded multiprofessional care, predominated the elderly with osteomuscular diseases (back pain, osteoarthritis - 30.7%), neurological diseases (parkinsonism, dementia -25.1%) and endocrine/nutritional diseases (diabetes I and II, overweight and obesity - 17.9%) (28, 29).

Certainly, the "saddle" represented by the longitudinal state of health in Parkinson's disease, brings relevant discussions, since further investigations on the interdisciplinary team in clinical management are still needed, with special attention to the costs and effectiveness of the team with intervention group control, as well as the description of therapeutic processes (30-39).

In the dynamics of understanding the "bicycle" model, several professionals from different areas of knowledge can compose the multiprofessional team of Parkinson's disease health care, and the most found studies in the literature for global health care are: dance (body

perception), hydrotherapy and swimming (aquatic motor skills, learning to swim and cardiorespiratory conditioning), physiotherapy (functional motor skills on the ground), gymnastics (body practices aimed at gains in strength and physical conditioning), music therapy (relaxation), memory exercises (prevention of memory deficits), cognitive and behavioral therapy (social relationship), stretching (maintenance and gain of range of motion), pilates (stretching, resistance and muscle strength), phonaudiology (attention to the process of speech and swallowing) and nutrition (attention to loss of lean mass and malnutrition) (22-25,29).

V. CONSIDERATIONS

We consider that scientific evidence is gradually beginning to report studies with an interdisciplinary approach, and the greater applicability in treatment programs for patients with Parkinson's disease with good results and improvement in quality of life is increasing.

The "bicycle" model has a broad scope, allowing a better understanding, between disease and therapy, advancing the strategies involved in the determinants of health status for an interdisciplinary approach to Parkinson's disease.

In summary, this review points to important gaps not yet described in the literature, contributing to new evidence in the interdisciplinary therapeutic approach to Parkinson's disease.

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